SNC2D Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Chapter 7 – Earth’s Climate System - Notes**

7.1 – Factors that Affect Climate Change

-When we look at climate change, we look at changes in the conditions of the Earth’s **atmosphere** (the thin layer of gases that surrounds Earth), which is composed mostly of N2 and O2, as well as H2O vapour, other gases, and solid particles. We also look at the Earth’s **hydrosphere** (the water found on, under, and over the surface of the Earth).

-**Climate** describes the average weather conditions of the atmosphere over a period of several years. It includes wind conditions, temperature, precipitation, etc.

-We can look at a **climatograph** (a graph of average climate data for a specific region that includes average monthly temperatures & precipitation), to get an idea of the climate of a particular area. See Figure 7.15 (p.280) & Figure 7.17 (p.284-285) for examples.

***What natural processes affect climate?***

-*Solar activity.* The sun cycles through periods of high and low activity, resulting in high and low amounts of solar radiation being emitted during these periods.

-*The orbit of the Earth around the Sun & the tilt of the Earth’s axis.*

-this causes different parts of the Earth to receive more or less solar radiation at different times of the year

-the mathematician Milutin Milankovic calculated that variations in the Earth’s orbit, tilt, and rotation cause

variations in the amount of solar radiation that reaches the Earth:

-Eccentricity: sometimes the orbit is more elliptical than circular due to the gravitational pull of other

planets.

-Tilt: The Earth’s angle of tilt varies between 22.1º and 24.5º, causing greater seasonal

temperature differences when the angle is larger.

-Wobble/Precession: Because the Earth is not a perfect sphere, it wobbles slightly as it rotates on

its axis, affecting the amount and intensity of the solar energy received by the poles.

-*The curve of the Earth’s surface.*

-causes solar radiation to be spread over a larger area at the poles and the mid-latitudes compared to the

equatorial regions.

-*The* ***greenhouse effect****.*

-natural warming caused by absorption of thermal energy by gases in the atmosphere.

-*Winds*.

-wind is the movement of air from an area of high pressure to an area of low pressure due to uneven

heating of the Earth’s surface.

-prevailing winds (westerlies & trade winds) move clockwise north of the equator & counter-clockwise

south of the equator

-jet streams carry weather systems great distances

-when air masses meet, one usually rises above the other, cooling & condensing to form precipitation

-*Ocean currents.*

-prevailing winds move ocean currents, which move heat around bodies of water

-***Albedo***(the fraction of energy that is reflected by a surface)

-lighter coloured surfaces such as snow reflect 80-90% of the solar energy, whereas darker coloured

surfaces such as oceans reflect about 7% of solar energy

-distribution of water, land, ice affect average global temperatures

-*Movement of* ***tectonic plates*** (12 major plates on the Earth’s surface)

-changes shape of land & water, and can cause volcanic activity causing particles that reflect solar

radiation & cool the global climate.

-Climate has changed over the billions of years of Earth’s history, but evidence indicates that the climate has been changing more quickly since the 1970’s. These changes cannot be accounted for by natural processes. There is growing evidence that the change is **anthropogenic** (resulting from the influence of humans), especially from the burning of fossil fuels (coal, oil, natural gas). What natural process is enhanced by burning fossil fuels?

7.2 – Describing Climates

-climate classification systems allow scientists to organize large amounts of information into smaller, simpler patterns, which help scientists understand how and why climates vary around the world & how climate affect other parts of the environment such as plants & animals

***Example of climate classification systems:***

-*Aristotle*: 3 major climate zones: tropical zone, polar zones, temperate zones

*-****Köppen climate classification system*** = method of identifying & describing climates based on observable

features such as temperature ranges & rate of precipitation

-5 zones: tropical moist climate; dry climate; moist mid-latitude climate with mild winters; moist

mid-latitude climate with cold winters (like southern Ontario); polar climate

-***biomes*** = largest division of the biosphere; large regions with similar types of climate & similar plants and

animals (i.e. boreal forest; desert; grassland; permanent ice; temperate deciduous forest; temperate rainforest;

tropical rainforest; tundra)

-***ecozones*** = divisions of Earth’s surface that have developed over a long period of time and are separated from

neighbouring ecozones by geological features such as oceans, deserts, or mountain ranges.

-subdivided into **ecoregions**

7.3 – Indicators and Effects of Climate Change

-**Global warming** is an increase in global average temperature, the rate of which has accelerated since the 1960s. Although direct measurements are uncertain due to natural fluctuations & bias from where measurements have been taken, it is difficult to deny the indirect evidence.

*Evidence of global warming:*

*-changes in polar & glacial ice*

-satellite photos have shown that large volumes of ice in Greenland and the Antarctic have

been melting at higher rates in recent years (first measurements were taken in 1970s)

-this directly affects animals such as polar bears & seals (reducing their habitats) & activity

of people in polar regions (e.g., Inuit population hunting)

*Other effects of global warming:*

-plants & animals can no longer survive in biomes as climate conditions change

-rising sea levels (due to melting ice)

-cause land to be submerged

-outbreaks of many diseases (e.g., hantavirus, lyme disease, malaria, plague) seem to increase during

periods of higher temperatures

-changes in wind & precipitation patterns

-low precipitation can lead to **desertification** & freshwater shortages

-hurricanes form over tropical waters & their severity increases with increased temperatures

-deforestation due to spread of pests in warmer weather & increased risk of forest fires

Increased carbon dioxide levels also leads to ocean acidity (forms carbonic acid)

-affects fish populatons & stability of coral reefs